

(72) CICCOLELLA, SERGIO A., US

(72) RONCA, DAVID RANDALL, US

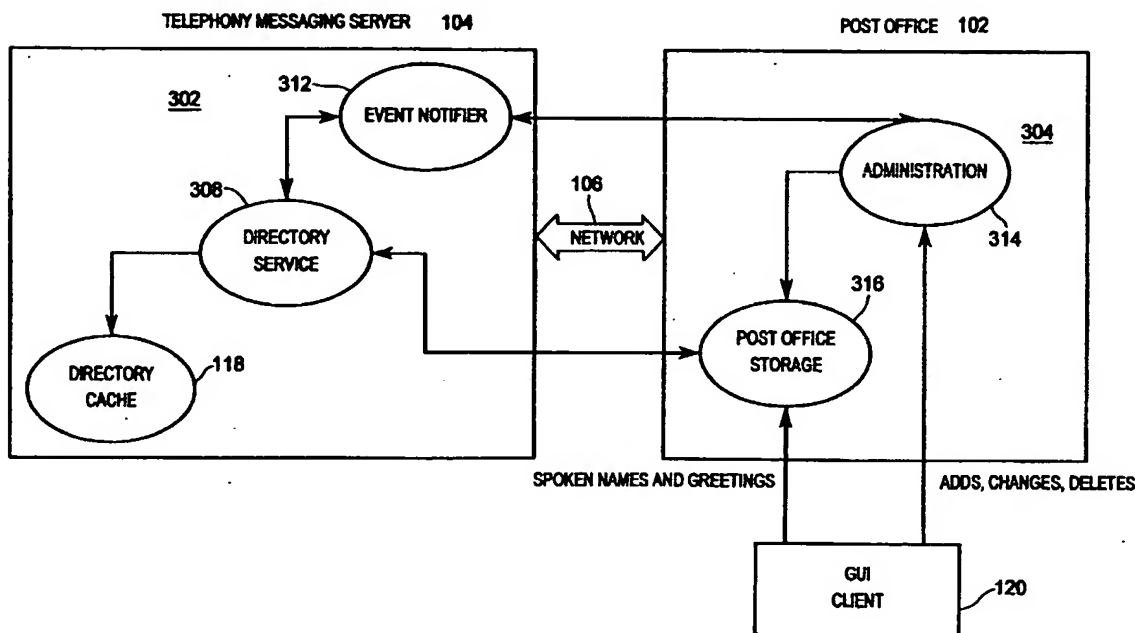
(71) MITEL, INC., US

(51) Int.Cl.<sup>7</sup> H04M 3/53

(30) 1999/02/26 (09/259,811) US

(54) **SYNCHRONISATION AUTOMATIQUE DE REPERTOIRES  
D'ADRESSES POUR MESSAGERIE UNIFIEE**

(54) **AUTOMATIC SYNCHRONIZATION OF ADDRESS  
DIRECTORIES FOR UNIFIED MESSAGING**



(57) A messaging system to store and retrieve messages for playback in response to user input commands includes a telephony messaging application responsive to incoming calls. A directory stores addressing information concerning addressable entities within the messaging system. The telephony messaging application accesses the directory in response to caller address queries. A post office stores user messages and includes addressing information concerning addressable entities within the messaging system. A synchronization mechanism synchronizes the addressing information in the directory with addressing information in the post office.

**ABSTRACT**

A messaging system to store and retrieve messages for playback in response to user input commands includes a telephony messaging application  
5 responsive to incoming calls. A directory stores addressing information concerning addressable entities within the messaging system. The telephony messaging application accesses the directory in response to caller address queries. A post office stores user messages and includes addressing information concerning addressable entities within the messaging system. A synchronization mechanism synchronizes the  
10 addressing information in the directory with addressing information in the post office.

**AUTOMATIC SYNCHRONIZATION OF ADDRESS  
DIRECTORIES FOR UNIFIED MESSAGING**

**Cross-Reference to Related Applications**

This application is related to: (i) U.S. Patent Application No. \_\_\_\_\_ (Att.Dkt.No. MITEP001) , filed on same day herewith, entitled "TEXT-TO-SPEECH CONVERTER"; (ii) U.S. Patent Application No. \_\_\_\_\_ (Att.Dkt.No. MITEP002), filed on same day herewith, entitled "AUTOMATIC USER PREFERENCE SELECTION FOR MESSAGE PLAYBACK BASED ON CALLER LINE IDENTIFICATION DATA"; and (iii) U.S. Patent Application No. \_\_\_\_\_ (Att.Dkt.No. MITEP004) , filed on same day herewith, entitled "DIAL BY NAME FEATURE FOR MESSAGING SYSTEM"; all of which are all incorporated herein by reference for all purposes.

**Field Of The Invention**

The present invention relates generally to messaging systems and, in particular, to a messaging system and method for maintaining synchronization of address directories.

**Background Of The Invention**

Voice messaging systems are common in today's business community. Most business organizations or enterprises make use of a private branch exchange (PBX) to direct a caller's telephone call to the appropriate extension of the called party. If the called party is unable to answer the telephone call, the telephone call is forwarded to a voice messaging system, which allows the caller to leave a voice message in the mailbox assigned to the called party. Messages left for called parties within the business organization can be retrieved from memory by calling the voice messaging system using a telephone and entering appropriate commands via a touch-tone keypad. Retrieved messages can be played, forwarded or deleted. An example of a voice messaging system of this nature is the Series 6 sold by Mitel Corporation of Ottawa, Ontario, Canada.

In addition to voice messages, communications within business organizations are also stored in facsimile and text formats. In the past, separate

Att. Dkt. No.: MITEP003

messaging systems have been used to handle these different types of communications. Unfortunately, prior art messaging systems designed to handle one type of communication have not provided any means to interact with messaging systems handling other types of communications. This has required users to access each messaging system individually to retrieve messages and has required business organizations to maintain and manage multiple messaging systems separately. As a result, it has been necessary to establish separate accounts, address lists and message mailboxes in each messaging system for the various users in the business organizations.

10 More recently, attempts have been made to interconnect different messaging systems to provide access to different types of messages from a single point. For example, U.S. Patent No. 5,349,636 to Irribarren discloses a system and method for voice mail systems and interactive voice response (IVR) systems. The Irribarren system includes a voice message system and a text message system  
15 integrated via a network, which coordinates the functions of each individual message system. A user may access messages stored in the voice message system and in the text message system via a single telephone call. Although this system allows access to different types of messages, the voice message and text message systems require separate management.

20 The current trend is to integrate these various messaging systems to allow users to access all types of communications once a connection is made to the messaging system. To that end, unified messaging systems have been developed to provide users access to virtually all of their communications. Messaging systems of this nature store all messages for entities within the enterprise at a common location.  
25 The entities may be individuals, groups, departments, or any appropriate logical organizations. Users accessing the messaging system via a telephone, desktop computer or other communication device have access to all of their messages regardless of message type and regardless of the type of communication device used to access the messaging system. Appropriate message translators such as text-to-  
30 speech (TTS) converters, speech-to-text (SST) converters, etc. are included to enable

-3-

users to retrieve messages stored in formats not supported by the communication devices used to access the messaging system.

Although users may access the messaging system using a telephone or desktop computer, the needs of a user accessing the messaging system using a telephone are different than those of a user accessing the messaging system using a desktop computer. In the case of sending messages created via a telephone connection to the messaging system, addressing is of particular concern. Address directories are often distributed throughout an enterprise for many reasons such as directory population, system capacity, geographical dispersion, etc. However, when using a telephone to access the messaging system, due to the nature of the interface, access to dispersed directories has typically been slow if not impossible. Access speed is of course an important issue for messaging systems.

In the past, address directories in local telephony messaging servers of messaging systems have been populated with knowledge of all remote users to allow local users to address messages to the remote users. This has of course required extensive management to ensure all non-local directories are updated when a directory change has been made. Accordingly, improvements to addressing in messaging systems are desired.

Thus, there is a need for maintaining synchronization of address directories in messaging systems.

### **Summary Of The Invention**

The present invention provides a messaging system where telephony functions of the messaging system are handled by a telephony messaging application while messages are stored at a separate post office. The post office maintains a database of the messages as well as address information. To facilitate fast and efficient access to addressing information, the telephony messaging application maintains a local database (e.g., directory cache) for enterprise wide addressing. This local directory, which is a subset of the addressing information of the post office, provides a fast addressing look-up service catering specifically to telephony users. Since the number of fields of addressing information stored in the directory is

typically less than that of any post office or external directory, the overall size of records in the directory is small. The result is a compact and efficient directory storing records of addressing information from multiple post offices and external directories. Furthermore, since the directory is automatically synchronized with the  
5 addressing information in the post office, the accuracy of the directory is maintained at a high level.

According to one aspect of the present invention there is provided a messaging system to store and retrieve messages for playback in response to user input commands, and which includes: a telephony messaging application responsive  
10 to incoming calls; a directory storing addressing information concerning addressable entities within said messaging system, said telephony messaging application accessing said directory in response to caller address queries; a post office to store user messages and including updatable addressing information concerning addressable entities within said messaging system; and a synchronization mechanism to  
15 synchronize the addressing information in said directory with addressing information in said post office.

In one embodiment, the synchronization mechanism is triggered in response to selected events and at selected intervals. The selected events include specified changes to critical addressing data stored in the post office. These specified  
20 changes may include changes to spoken greetings, changes to message destination data, and changes enabling telephone access to the messaging system.

In another embodiment, the selected intervals are programmable. As an example, the synchronization mechanism can be responsive to a timer in the telephony messaging application which fires at the selected intervals.

25 In still another embodiment, the synchronization mechanism includes an event notifier responsive to the timer and a directory service in communication with the post office. The event notifier polls the post office for addressing information that has changed since the last polling cycle. The directory service receives changed addressing information from the post office and updates the  
30 directory accordingly.

-5-

In yet another embodiment, the synchronization mechanism further validates all of the addressing information in the directory with corresponding addressing information in the post office at specified second intervals and synchronizes its clock with the post office clock at the selected intervals.

5           According to yet another aspect of the present invention there is provided in an messaging system, a method for synchronizing addressing information stored in a directory of a telephony messaging application with addressing information stored in a post office, said method comprising: at selected intervals, determining if changes to the addressing information in said post office have been  
10   made and, if so, updating the addressing information in said directory; and in response to selected changes in addressing information in said post office, updating the addressing information in said directory.

          According to yet another aspect of the present invention there is provided in an messaging system, a method for synchronizing addressing information  
15   stored in a directory for a telephony messaging application with addressing information stored in a central database, said method comprising: determining when specific events have occurred at the telephony application; promptly synchronizing the directory and the central database with respect the specific events that have been determined to have occurred; and otherwise periodically synchronizing the directory  
20   and the central database at a predetermined time interval.

#### **Brief Description Of The Drawings**

An embodiment of the present invention will now be described more fully with reference to the accompanying drawings in which:

25           Figure 1 is a diagrammatic overview of a unified messaging system in accordance with the present invention;

          Figure 2 is a diagrammatic representation of directory cache records stored in a directory cache forming part of the unified messaging system of Figure 1;

          Figure 3 is a diagrammatic representation of the synchronization  
30   processing in the unified messaging system of Figure 1;

-6-

Figure 4 is a flowchart diagram illustrating polling based synchronization of the unified messaging system of Figure 1; and

Figure 5 is a flowchart diagram of event based synchronization of the unified messaging system of Figure 1.

5

#### **Detailed Description Of The Invention**

Turning now to Figure 1, a messaging system is shown and is generally indicated by reference numeral 100. Messaging system 100 includes a post office 102 communicating with a telephony messaging server 104. The post office 102 runs on  
10 one or more servers behaving logically as a single entity and is connected to the telephony server 104 via a local area network 106. Post office 102 communicates with clients 108, only one of which is shown for illustrative purposes, via a local area network, modem or other communication channel 110. Post office 102 and telephony messaging server 104 also communicate with external messaging systems via wide  
15 area networks 111 and 112 respectively.

The post office 102 provides message storage and delivery facilities for users of the messaging system 100 and includes mailboxes in which messages for the users are stored. The post office 102 handles and stores user messages regardless of format. Thus, the post office 102 stores voice messages received from the telephony  
20 messaging server 104 as well as text messages, facsimile messages, graphics messages, etc. received from client 108 and/or wide area network 111. The post office 102 also maintains a directory database of user information including addresses, locations and addressing related information as well as user preference records as will be described. The directory database information is accessible, retrievable and  
25 updatable using database type queries. In the preferred embodiment, post office 102 runs commercially available post office software such as Microsoft Exchange ® sold by Microsoft Corporation of Redmond Washington.

In one embodiment, telephony messaging server 104 is a model TS800 telephony server provided by Mitel Corporation of Ottawa, Ontario or similar PC-  
30 based model. The telephony messaging server 104 executes a voice messaging application to handle incoming telephone calls which cannot be completed. As is well



-7-

known to those of skill in the art, the voice messaging application includes a speech file administrator which retrieves prerecorded voice message prompts from a database to direct a caller to leave a message for a particular called party. Messages recorded by the voice messaging application are conveyed to the post office 102 for storage in the appropriate mailboxes. The voice messaging application also handles incoming user calls to allow users to retrieve messages stored in their mailboxes.

Telephony users may access the voice messaging application using a typical telephone or telephony device 114 providing telephone functions that is either directly connected to telephony messaging server 104 or connected to the telephony messaging server 104 through a private branch exchange (PBX) and a publicly switched telephone network PSTN (not shown). During access, users enter touch-tone commands and passwords to retrieve messages from their mailboxes in the post office 102. The voice messaging application calls the speech file administrator, which provides the appropriate voice message prompts to navigate users through the voice messaging application. During message playback, if a message stored in a user's mailbox is in a format not supported by the telephone or telephony device 114 used to access the messaging system 100, the voice messaging application calls an appropriate message translator to convert the message into a form which can be played back to the user.

The telephony messaging server 104 communicates with a directory cache 118 that is updated by the post office 102. The directory cache 118 stores a subset of the information stored by the post office 102. Specifically, the directory cache stores addressing information for users and groups associated with the messaging system 100. The telephony messaging server 104 accesses the directory cache 118 in response to user and caller queries made via a telephone device 114 to reduce directory search times and provide a fast addressing service as will be described.

Client 108 in this embodiment, is associated with or in the form of a computing device such as a personal computer 120. Through personal computer 120, a user can access voice messages, facsimile messages, electronic mail messages, etc. stored in their post office mailbox. The user can also use personal computer 120 to

perform messaging functions such as create, attach, read, modify, reply, forward, store and delete messages of various types. In one embodiment, the personal computer 120 runs Microsoft Outlook® client messaging software sold by Microsoft Corporation. The client messaging software provides a graphical user interface (GUI) to display the user's messages held in their post office mailbox and to allow the user to invoke messaging functions. Since the mailboxes store messages in different formats, it is preferred that the personal computer 120 includes appropriate hardware and software to allow all message types to be retrieved. In cases where the personal computer 120 does not include the hardware and/or software necessary to support certain message types, appropriate message translators can be called to convert the messages into a form compatible with the personal computer 120.

A user wishing to deliver a message to or retrieve a message from another user through a connection to the telephony messaging server 104 via a telephone device 114 has different needs and requirements than a user who obtains access to post office 102 through personal computing device 120. Speed of access and message addressing are especially important when using a telephone device since telephony devices are typically auditory in nature with no visual feedback. Furthermore, tasks invoked via a telephone device 114 are serialized so that activities cannot be performed while waiting. Therefore, to provide for the unique needs of a user accessing the messaging system 100 via a connection to the telephony messaging server 104 through a telephone device 114, the directory cache 118 is utilized.

The telephony messaging server 104 maintains the directory cache 118 for enterprise wide addressing and optionally also for external addressing. The directory cache 118 provides a fast addressing look-up service and allows the telephony messaging server 104 to perform messaging to any recipient in the enterprise without a degradation of response time. Optionally, the telephony messaging server 104 can be configured to query remote post offices to obtain addressing information for remote users and entities outside the enterprise. In one embodiment, the directory cache 118 is implemented as a database within telephony messaging server 104 and, more particularly, can be a commercially available SQL database providing remote query and update functions.

Within the database implementing the directory cache 118 is a directory cache record for each addressable user, group, department or logical organization within the enterprise. Turning now to Figure 2, a plurality of directory cache records 202 to 208 are shown for illustrative purposes. It should be appreciated that many more directory cache records than those illustrated are included in the directory cache 118. As can be seen, each directory cache record includes a name field 210, a dial by name field 212, a mailbox field 214, and an extension field 216. The fields described above are not meant to be exhaustive and other fields can be included in the directory cache records if desired. The dial by name field 212 holds digits corresponding to the spelling of the name in the name field 210 using a touch-tone keypad, regardless of whether the name is an individual, group, department or logical organization within the enterprise. In this particular example, directory cache records 206 and 208 are assigned to individuals within the enterprise, while directory cache records 202 and 204 are assigned to departments within the enterprise. The telephony messaging server 104 uses the information in the directory cache records to facilitate addressing of messages to be sent to other users, groups, departments or logical organizations within the enterprise. The digits in the dial by name fields 212 allow a user to direct messages by dialing the recipient's name. Further details of the dial by name feature are described in co-pending U.S. Patent Application No. \_\_\_\_\_ (Att.Dkt.No. MITEP004) , filed on same day herewith, entitled "DIAL BY NAME FEATURE FOR MESSAGING SYSTEM";, the contents of which are incorporated herein by reference.

Table 1 below shows further detail concerning representative information stored in each directory cache record and the rationale for storing the information.

Table 1

| CACHE DATA                    | RATIONALE  |
|-------------------------------|--|
| Post Office User ID           | Give the Post Office a unique addressing identifier.   |
| Display Name                  | Convenient search criteria but may not be unique.  |
| Dial By Name Digits           | Search by entering digits corresponding to the concatenation of Last Name and First Name and converted to their numeric match on the telephone keypad. |
| Mailbox Number                | Numeric identification of subscriber. Not required to be identical to the telephone extension.   |
| Telephone Extension Number    | Outside identification of number dialed to reach the subscriber.   |
| Fax Direct Inward Dial Number | Direct number dialed to deposit faxes in the Unified Messaging Mailbox.  |
| User Spoken Name              | Provides confirmation of recipient when subscriber creates a message for delivery.   |
| User Spoken Greeting          | Provides confirmation to outside caller depositing a voice message from a telephone.   |

5                   Directory cache 118 and post office 102 store corresponding  
addressing and related information. Therefore, in order to maintain addressing  
integrity, it is necessary to ensure the directory cache 118 and post office 102 are  
synchronized. To achieve this, both the telephony messaging server 104 and post  
office 102 include synchronization components in the form of software processes to  
10 maintain their respective address directories. During synchronization, the telephony  
messaging server 104 connects to the post office 102 and makes queries to  
automatically obtain and update the addressing information in the directory cache 118.  
In one embodiment, telephony messaging server 104 uses the industry standard  
messaging application programming interface (MAPI) to create time polling queries  
15 and uses distributed programming techniques to create queries and receive event  
notifications as will be described further below.

Turning to Figure 3, the synchronization components of the directory  
cache 118 and the post office 102 are better illustrated. The synchronization  
component of the telephony messaging server 104 includes a directory service 308  
20 and an event notifier 312. The directory service 308 manages and synchronizes the

-11-

directory cache 118 and performs any necessary data translation functions. Event notifier 312 communicates with the directory service 308 and with the post office 102. The event notifier 312 receives and transmits messages when events occur. Events may be triggered by the directory service 308 or by the post office 102.

5           The synchronization component of the post office 102 includes an administrative component 314 and a post office storage 316. The administrative component 314 communicates with the post office storage 316, the event notifier 312 and the personal computer 120 through the GUI. Access to the administrative component 314 via the personal computer 120 allows a user to add, change and delete  
10 address information within the post office storage 316. The administrative component 314 monitors the post office storage 316 and coordinates the transfer of messages and the synchronization of the post office 102 with other address directories (including directory cache 118). The administrative component 314 also performs any necessary data translation functions.

15           Changes to address information in the post office 102 may be initiated through personal computer 120 as mentioned above or via a telephone device 114 through the telephony messaging server 104. In order to maintain consistency and coherency between the directory cache 118 and the post office 102, a robust but flexible synchronization mechanism is required. In the present embodiment, the  
20 synchronization components of the telephony messaging server 104 and the post office 102 use a combination of polling based synchronization and event based synchronization to ensure that the addressing information stored in the directory cache 118 and the post office 102 are the same. While it is important to maintain accurate directory data, frequent updates can expend a lot of processing resources to the  
25 detriment of overall messaging system performance. By selecting the type of synchronization mechanism to be used based on the type of directory change, address directory integrity can be maintained while avoiding excess use of processing time. Specifically, data which is key to addressing is updated immediately using event based synchronization, while non-critical addressing data is updated using polling  
30 based synchronization.

-12-

Referring now to Table 2 below, the types of data changes that are synchronized using event based synchronization are illustrated in the column entitled Immediate. The types of data changes that are synchronized using polling based synchronization are illustrated in the column entitled Poll Cycle Interval. Table 2 also shows data changes that are dealt with by validation.

**Table 2**

| IMMEDIATE  | POLL CYCLE INTERVAL<br>(default every 10 minutes)                      | VALIDATION<br>(default 1X day, 1 <sup>st</sup> poll after 2 a.m.)    |
|--|--|--|
| Spoken Greetings   | Spoken Name changed from the GUI                                       |  |
| All administrator Unified Messaging data (tel#, MB#, fax DID#) relevant to addressing messages | First Name and Last Name from the administrator changing a user's name |  |
| Adds, Changes to enable Unified Messaging telephone access by the subscriber                   |  | User deleted by administrator from outside Unified Messaging control |

The combination of event based synchronization and polling based synchronization yields an efficient mechanism which achieves a balance between frequent polling cycles that consume too many resources and the necessity to synchronize immediate changes between the directory cache 118 and the post office 102. Specifics of the polling based synchronization methodology will now be described with particular reference to Figure 4.

Upon initialization, the telephony messaging server 104 initiates a timer that fires at predetermined intervals, which may vary in length depending on the circumstances (block 402). In one embodiment, the timer fires in a regular cycle, typically every ten minutes. When the timer fires, the telephony messaging server 104 gets the time from the post office 102 since it is possible that the clocks of the telephony messaging server and the post office are not synchronized (block 404). The synchronization of time between the clocks of the telephony messaging server 104 and the post office 102 is necessary to determine which address records have changed

-13-

since the last poll cycle update. Once the clocks are synchronized, the telephony messaging server 104 determines whether a previous poll cycle has taken place since the time of initialization or start-up of the telephony messaging server 104 (block 406). If no previous poll cycle has taken place, that is, the telephony messaging server 104 has just been initialized or started, then the directory service 308 sends a signal to event notifier 312. Event notifier 312 in turn sends a message to administrative component 314 at post office 102 requesting the transmission of address records from post office storage 316 (block 408). Post office 102 in turn sends the appropriate address records back to directory service 308. When directory service 308 receives the address records, it populates the directory cache 118 with corresponding directory cache records (block 410).

If at block 406 a previous poll cycle had taken place, then the directory service 308 sends a signal to event notifier 312, which in turn sends a message to the post office 102 for all telephony address data that has changed since the last polling cycle (block 412). When all of the changed or new data from the post office 102 is received by the directory service 308, the data is inserted into the directory cache 118 (block 410). At this point, the telephony messaging server 104 checks to see if this is the first poll cycle after a preset time in this case 2 a.m. (block 414). If not, the polling cycle ends (block 416).

However, if the poll cycle is the first poll cycle after 2 a.m., every directory cache record in the directory cache 118 of telephony messaging server is validated with the post office 102 and corrected as necessary (block 418). The validation provides a higher level of confidence and fault tolerance in the synchronicity of the telephony messaging server 104 and the post office 102. The rationale is that it is useful to verify all of the data in the directory cache 118 to ensure that it is properly synchronized with the data in the post office, and correct such data as necessary.

Turning now to Figure 5, the event based synchronization methodology is illustrated. As can be seen, when the telephony messaging server 104 is initialized, the event notifier 312 generates an event (block 502).

-14-

In response to the event, the directory service 308 registers an interest in the event and blocks on the event. The directory service 308 in turn sends a signal to the event notifier 312 which in turn sends an event to the administrative component 314. The administrative component 314 in response to the event, makes an addition, modification or deletion to the address data in the post office storage 316 that is of interest to the telephony messaging server 104. The administrative component 314 then sends a signal to the event notifier 312 with the information on the event (block 508), which may include the change type (add, modify, or delete) and the user account ID. The event notifier 312 signals the directory service 308 that the specific named event has occurred. The directory service 308 in turn unblocks on the event and uses the information received from the event notifier 312 to make a specific request for the necessary data from the post office 102 to synchronize the directory cache 118 with the address directory in the post office storage 316 (block 510). The post office 102 then sends the specific data to the directory service 308 and the directory service updates the directory cache 118 accordingly. At this point, the telephony messaging server returns to step 504 and waits for the next event.

As will be appreciated, since the address information in the post office 102 and the address information in the directory cache 118 of the telephony messaging server 104 is synchronized at predetermined intervals and when certain events occur, addressing integrity in the messaging system 100 is maintained. This allows the telephony messaging server 104 to use the directory cache 118 for addressing, which stores less information than the post office, and therefore, provides for quicker searching, without compromising addressing capabilities.

Although a preferred embodiment of the present invention has been described, those skilled in the art will appreciate that variations and modifications may be made without departing from the spirit and scope thereof as defined by the appended claims.



-15-

**We Claim:**

1.           A messaging system to store and retrieve messages for playback in  
5   response to user input commands comprising:  
            a telephony messaging application responsive to incoming calls;  
            a directory storing addressing information concerning addressable  
            entities within said messaging system, said telephony messaging application accessing  
            said directory in response to caller address queries;  
10           a post office to store user messages and including updateable  
            addressing information concerning addressable entities within said messaging system;  
            and  
            a synchronization mechanism to synchronize the addressing  
            information in said directory with addressing information in said post office.  
15
2.           A messaging system as defined in claim 1 wherein said  
            synchronization mechanism is triggered in response to selected events and at selected  
            intervals.
- 20   3.           A messaging system as defined in claim 2 wherein said selected events  
            include specified changes to the addressing information in said post office.
4.           A messaging system as defined in claim 3 wherein said specified  
            changes relate to changes to critical message addressing data.  
25
5.           A messaging system as defined in claim 4 wherein said specified  
            changes to critical message addressing data include at least one of changes to spoken  
            greetings, changes to message destination data, and changes enabling telephone access  
            to said messaging system.  
30

-16-

6. A messaging system as defined in claim 2 wherein said selected intervals are programmable.
7. A messaging system as defined in claim 6 wherein said  
5 synchronization mechanism is responsive to a timer in said telephony messaging application, said timer firing at said selected intervals.
8. A messaging system as defined in claim 7 wherein said  
10 synchronization mechanism comprises an event notifier responsive to said timer and a directory service in communication with said post office, said event notifier polling said post office for addressing information that has changed since a last polling cycle, said directory service receiving changed addressing information from said post office and updating said directory accordingly.
- 15 9. A messaging system as defined in claim 2 wherein said synchronization mechanism further validates all of the addressing information in said directory with corresponding addressing information in said post office at specified second intervals.
- 20 10. A messaging system as defined in claim 7 wherein said synchronization mechanism includes a clock, said synchronization mechanism synchronizing the clock with a second clock in said post office at regular intervals.
11. A messaging system as defined in claim 10 wherein said regular  
25 intervals are coincident with said selected intervals.
12. A messaging system as recited in claim 1 wherein said directory is a cache directory as compared to the addressing information stored in said post office, and wherein the amount of the addressing information stored in said cache directory is  
30 significantly less than the amount of the addressing information stored in said post office.

-17-

13. A messaging system as recited in claim 12 wherein said post office stores the addressing information in records of a first database, and said cache directory stores the addressing information in records of a second database, and  
5 wherein the size of the records of the second database are substantially smaller than the size of the records of the first database.

14. A messaging system as recited in claim 13, wherein the records of the second database have less fields than the records of the first database.

10

15. A messaging system as defined in claim 7 wherein said synchronization mechanism comprises an event notifier and a directory service in communication with said post office, said event notifier polling said post office for addressing information that has changed since a last polling cycle, said directory  
15 service receiving changed addressing information from said post office and updating said directory accordingly.

16. A messaging system as recited in claim 1 wherein said directory is a cache directory as compared to the addressing information stored in said post office,  
20 and wherein the amount of the addressing information stored in said cache directory is significantly less than the amount of the addressing information stored in said post office.

17. A messaging system as recited in claim 16 wherein said post office  
25 stores the addressing information in records of a first database, and said cache directory stores the addressing information in records of a second database, and wherein the size of the records of the second database are substantially smaller than the size of the records of the first database.

30 18. A messaging system as recited in claim 17, wherein the records of the second database have less fields than the records of the first database.

-18-

19. In an messaging system, a method for synchronizing addressing information stored in a directory of a telephony messaging application with updatable addressing information stored in a post office, said method comprising:
- 5 at selected intervals, determining if changes to the addressing information in said post office have been made and if so, updating the addressing information in said directory; and
- in response to selected changes in addressing information in said post office, updating the addressing information in said directory.
- 10
20. A method of claim 19 wherein said selected changes relate to changes to critical message addressing data.
21. A method of claim 20 wherein said selected changes to critical
- 15 message addressing data include at least one of changes to spoken greetings, changes to message destination data, and changes enabling telephone access to said messaging system.
22. A method of claim 19 wherein said selected intervals are
- 20 programmable.
23. A method of claim 22 further comprising:
- firing a timer at said selected intervals; and
- updating the addressing information in said directory in response to
- 25 said timer if changes have been made to the addressing information in said post office.

-19-

24. A method of claim 23 further comprising:  
validating all of the addressing information in said directory with  
corresponding addressing information in said post office at specified second intervals.

5 25. A method of claim 24 further comprising:  
synchronizing clocks in said telephony messaging application and said  
post office at regular intervals corresponding with said selected intervals.

26. In an messaging system, a method for synchronizing addressing  
10 information stored in a directory for a telephony messaging application with  
addressing information stored in a central database, said method comprising:  
determining when specific events have occurred at the telephony  
application;  
promptly synchronizing the directory and the central database with  
15 respect the specific events that have been determined to have occurred; and  
otherwise periodically synchronizing the directory and the central  
database at a predetermined time interval.

27. A method of claim 26 wherein said periodically synchronizing  
20 comprising:  
obtaining from the central database all addressing information stored in  
the directory that has been changed or added since a last periodic synchronization was  
performed;  
forwarding the obtained addressing information to the directory; and  
25 updating the directory in accordance with the obtained addressing  
information from the central database.

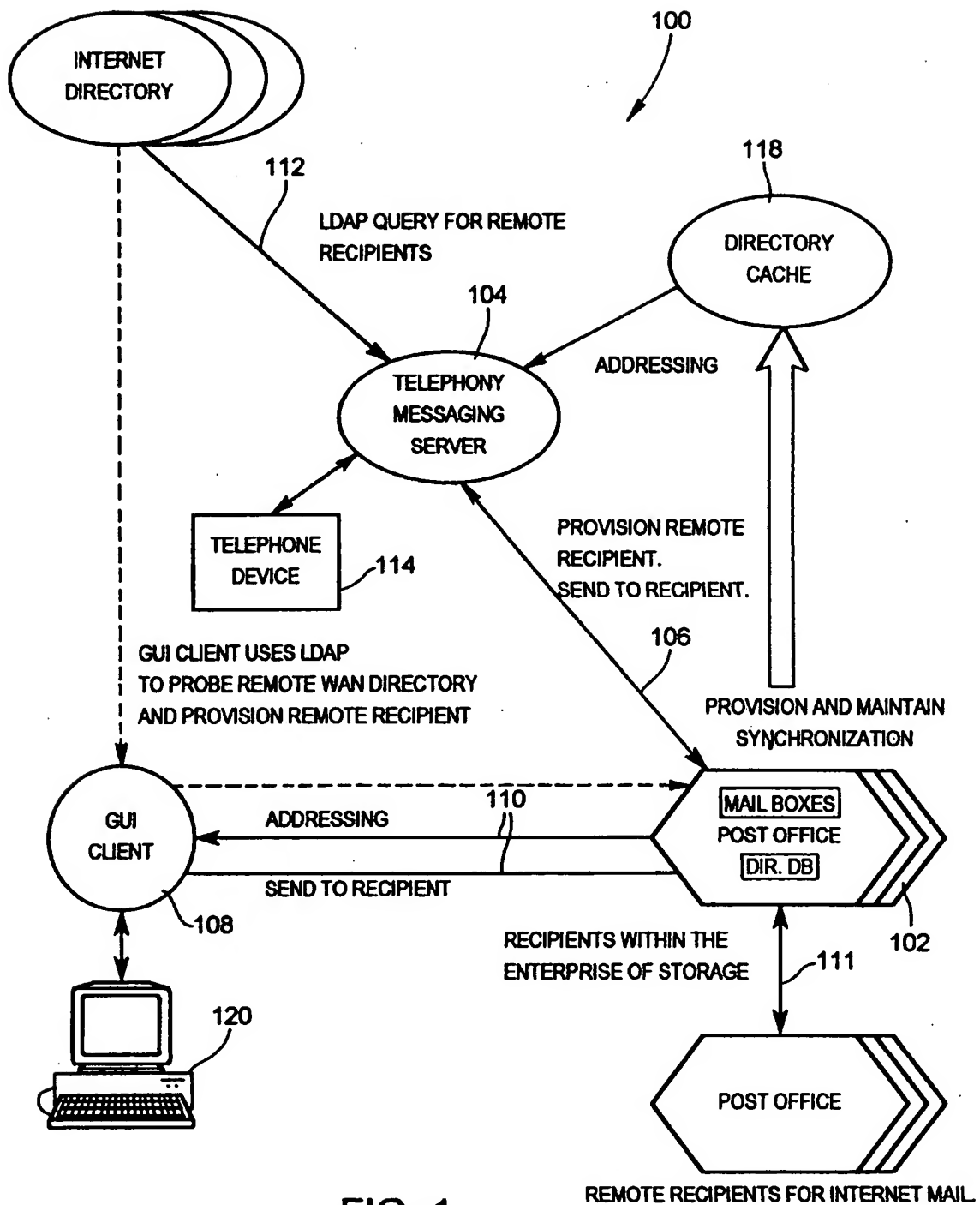
-20-

28. A method of claim 26 wherein the directory is a directory cache that stores a portion of the addressing information stored in the central database, and wherein the directory cache provides a fast addressing look-up service to telephony users of the telephony application.

5

29. A method of claim 26 wherein the specific events pertain to changes to critical message addressing information included within the addressing information.

30. A method of claim 29 wherein the critical message addressing  
10 information includes changes to spoken greetings, changes to message destination data, and changes enabling telephone access to said messaging system.

**FIG. 1**

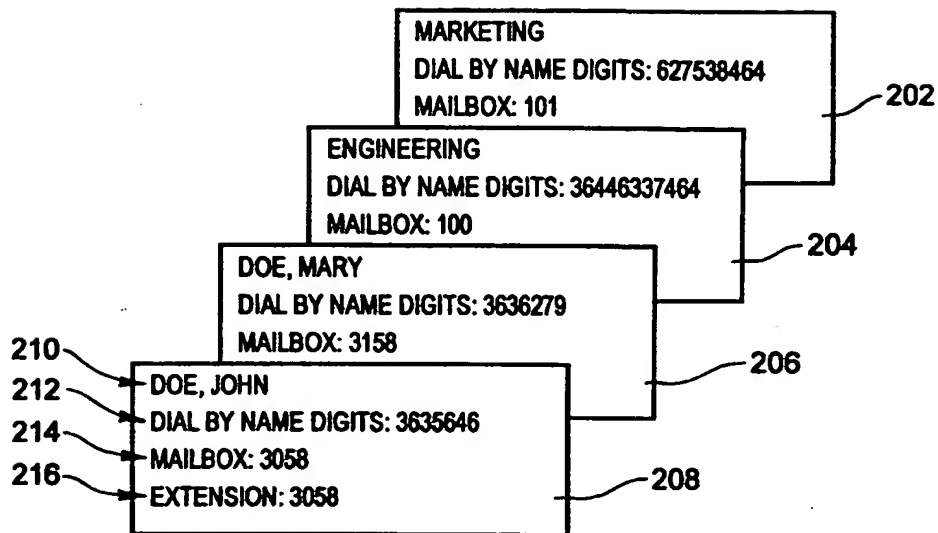
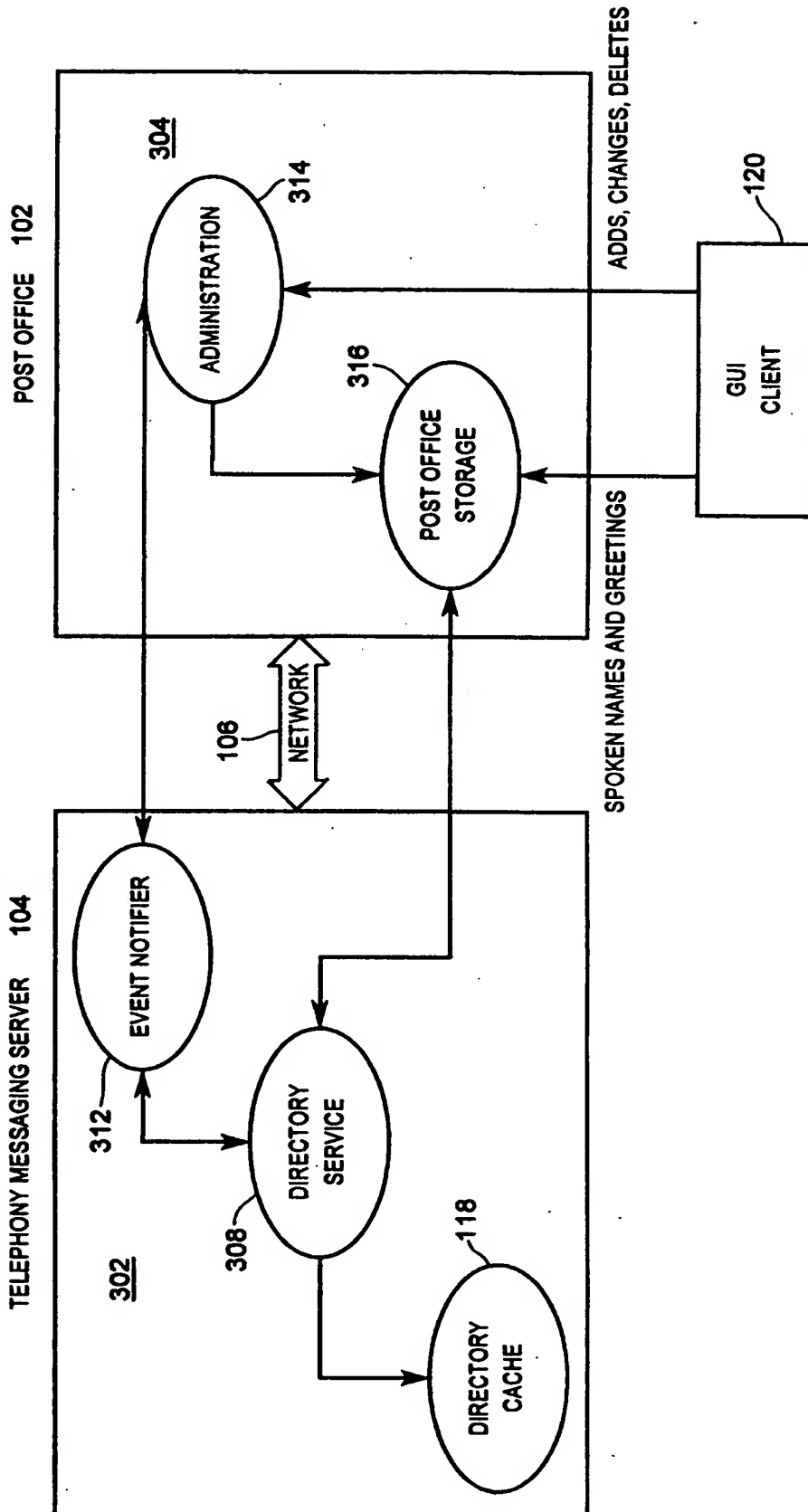
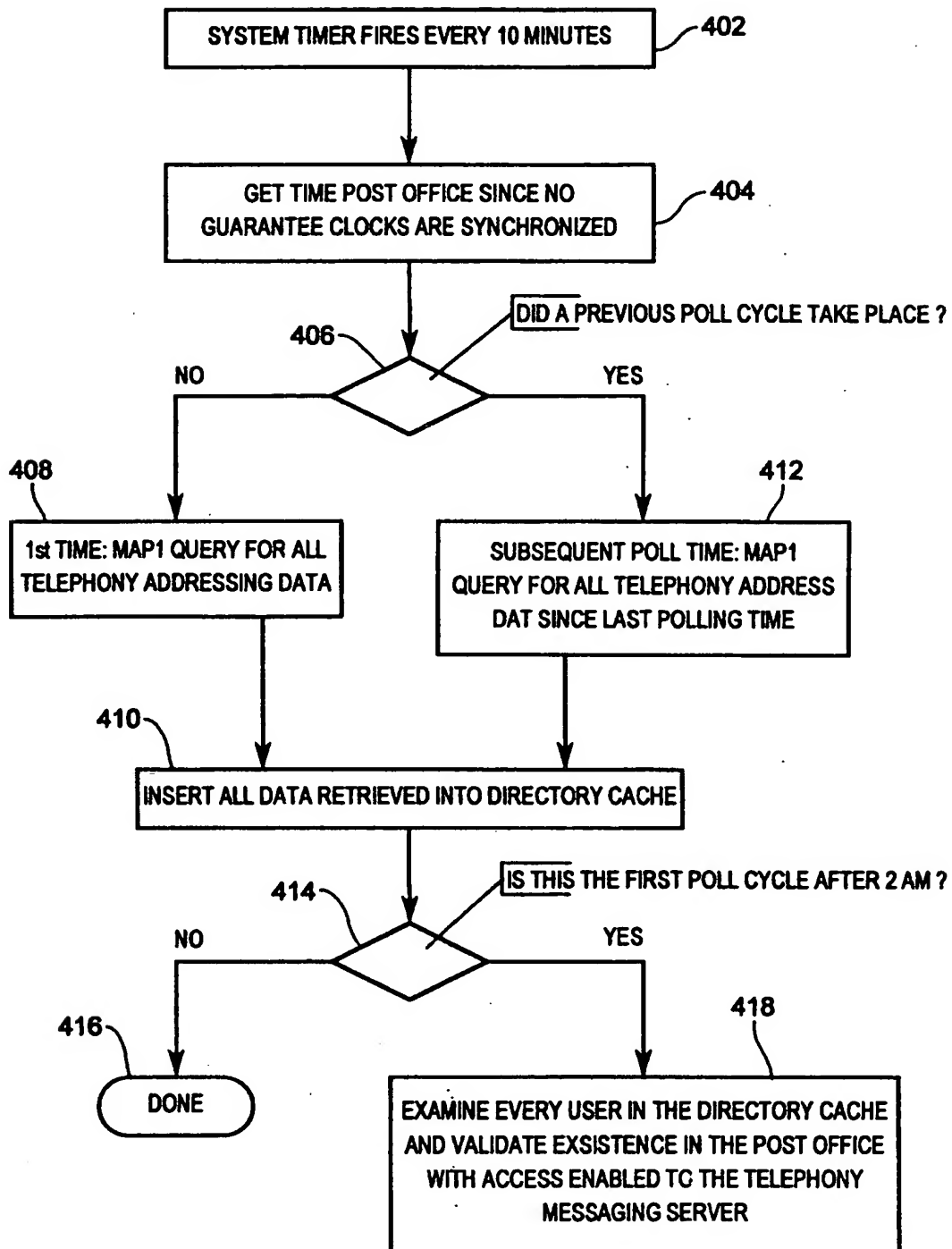


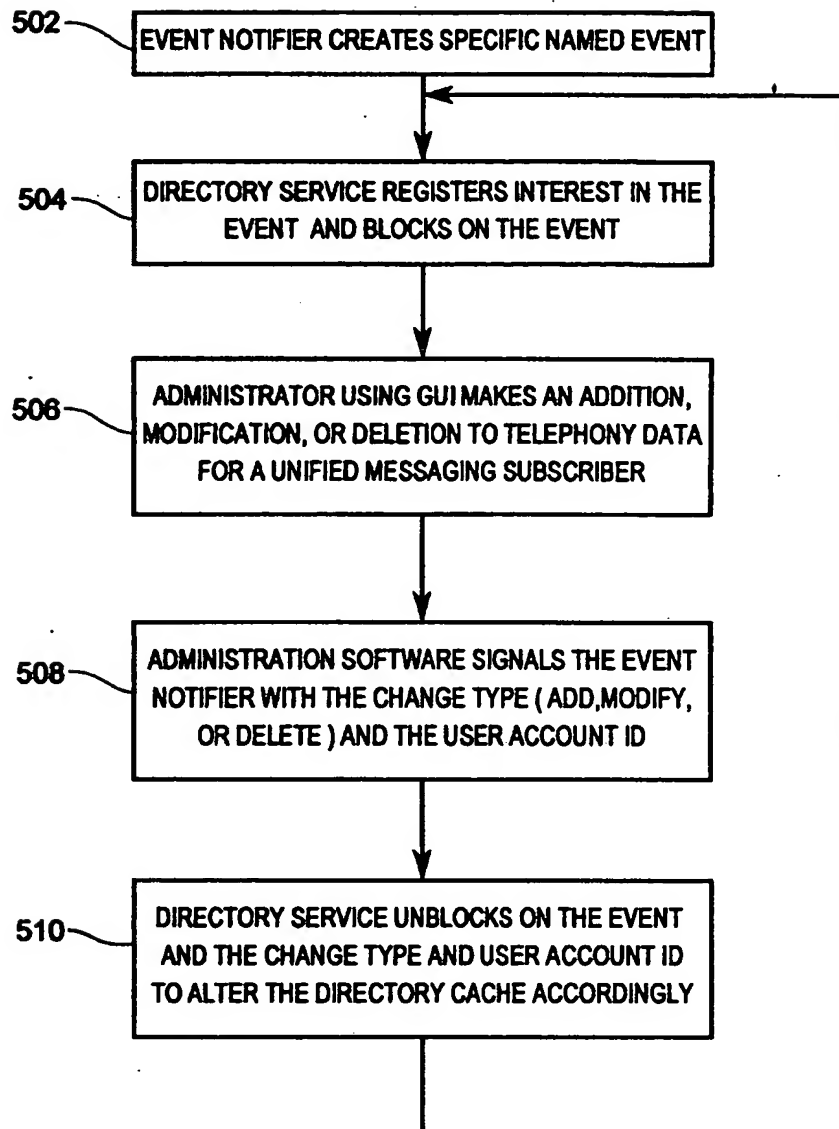
FIG. 2





**FIG. 3**

**FIG. 4**

**FIG. 5**